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vian guinea-pigs is dominant over the normal, or smooth-coated, condition.

To these two pairs of Mendelian characters we may now add a third: 'Angora,' or long coat, is recessive with respect to the normal short coat. This fact was first discovered accidentally when a number of long-haired young were obtained by inbreeding a stock of short-haired guinea-pigs supposedly pure. A parallel result was obtained in the case of rabbits. Two rabbits, brother and sister, whose ancestors for at least two generations were known to have been short-haired, produced, in a litter of six young, two long-haired, or 'Angora,' individuals.

As a result of experiments subsequently made, it may now be said that, in the case of guinea-pigs and rabbits (and probably in other mammals also):

(1) Two long-haired animals of whatever ancestry produce only long-haired young; (2) a short-haired animal of pure stock, mated to a long-haired animal, produces offspring all short-haired; (3) a short-haired animal, one of whose parents was long-haired, when mated to a long-haired animal produces offspring, some short-haired, others long-haired, the two sorts occurring in approximately equal numbers; (4) two hybrid short-haired animals (like the one described under 3) when mated to each other produce long-haired and short-haired offspring approximately in the ratio, 1:3. These various facts agree in showing that short coat is 'dominant' in heredity over long or Angora coat.

The writer recalls seeing in the daily press some months ago a brief despatch (which unfortunately he did not preserve) recording the exportation (to Hagenbeck, he thinks) of the 'last of the Oregon Wonder horses,' which had mane and tail fourteen feet long. A short account, which was given, of the ancestry of this abnormally long-haired horse suggested to the writer that the long-haired character was in this case, as in rabbits and guinea-pigs, inherited as a recessive, and that the so-called 'last' of the long-haired horses need not have been such had the owner been familiar with the scientific principles of breeding. If any reader of SCIENCE can give

further information about these long-haired Oregon horses, the writer would be very grateful to receive it. It seems to him extremely probable that in mammals in general an abnormally long coat behaves as a recessive character in heredity, when brought by cross-breeding into competition with the normal coat character. If so, this fact makes clear some matters which have been hitherto obscure and which have received a different but hardly satisfactory explanation. Thus Darwin attributes to the direct influence of the climate the long-haired coat character of the goats, shepherd-dogs and cats of Angora, and states on authority that the Karakool breed of sheep lose their peculiar fine, curled fleece when removed from their native canton near Bokhara. It is clear that a long-haired breed of animals would apparently lose that character completely and immediately, if allowed to cross with other breeds, as would likely be the case upon removal to a new locality. Yet this loss would occur irrespective of any climatic influence.

It is hoped that the facts here communicated may prove of some value to breeders of sheep and goats, such as are kept primarily for the fleece, as well as to breeders of pet stock. May we not work more intelligently for the improvement of our flocks, knowing the conditions under which the long-haired coat is transmitted?

W. E. CASTLE.

ZOOLOGICAL LABORATORY,
HARVARD UNIVERSITY,
November 23, 1903.

CONCERNING MOSQUITO MIGRATIONS.

IN the pages of SCIENCE I have recorded from time to time the results of my observations upon the habits of the ring-legged salt marsh mosquito, *Culex sollicitans*, and have expressed my conviction that it was a migratory form; limited in its breeding areas, but widely distributed and dominant for long distances away from them. In my study of the problem as it exists in New Jersey, this migration question is of the utmost importance, since local work can never be entirely effective if the mosquito supply comes from a place beyond the range of local jurisdiction. It is

absolutely necessary that the point should be positively determined, since no comprehensive plan can be formulated without considering how such migratory forms should be dealt with and what authority should have control.

During the season of 1902 I worked out the life cycle of *Culex sollicitans*, and satisfied myself that it was a true migrant. I found associated with it three other species, breeding under similar conditions, whose status I could not altogether fix. These were *C. nigritulus*, *C. tæniorhynchus* and one which I made certain was different from described species; but which was then determined by authorities to be a form of *C. sylvestris*. Further study proved my contention as to this species to be correct, and it has been recently named *C. cantator* by Mr. Coquillett. All these breed on the salt marshes and, as a rule, on the marshes only, though the water may be salt or fresh. *C. nigritulus* I have never found far away from the edge of the marsh in the adult condition. *C. tæniorhynchus* never flies very far nor in any considerable numbers. *C. cantator* and *sollicitans* have equal powers of flight and either may be dominant on the marsh at a given period, or both may be equally abundant.

Investigations made in 1903 indicate that *C. cantator* gets an earlier start and may fly long before *sollicitans* appears in large broods. Further, it is more northern in its range and, while it equals or exceeds *sollicitans* on the Raritan and Newark marshes, it is hardly noticeable from Barnegat Bay southward.

C. cantator is a stout, hairy yellowish-brown mosquito with obscurely banded legs; very different from the bright contrasts found in *sollicitans*.

To determine the question of migration and breeding areas positively, one observer was located at Cape May from the beginning of June to the end of September, with instructions to watch *C. sollicitans* day by day and, if it bred anywhere on the peninsula, to find the breeding places. Mr. Henry L. Viereck, who made these observations, reports positively that, while the adult occurred throughout the territory assigned to him, it bred only on the salt marshes or at their edge. Furthermore,

he observed directly that, shortly after a brood emerged on the marshes, there would come a sudden decrease in the numbers of adults and a corresponding increase at points inland. In all his collectings not a *sollicitans* larva was found in the fresh-water swamp area of the peninsula!

Six other collectors were regularly in the field during the breeding season—not intermittently, but daily, and the result was that thirty-three species of mosquitoes were collected. And of these, thirty-one were actually bred from larvæ during the summer! Much of this collecting was done in the regions dominated by *sollicitans* and *cantator*, yet neither was found at any time in the larval stage away from the salt marshes or their edge.

Personally I watched the emergence of an early brood of *cantator* on the Newark meadows before there was a mosquito in the city, and when the surroundings on the hillside had been thoroughly surveyed and no similar larvæ discovered. These adults were watched from day to day as they spread inland until the city swarmed with them and they invaded the surrounding country in every direction. *C. sollicitans* did not at any time in 1903 dominate the Newark meadows as it did in 1902, and *cantator* was not generally recognized at first as a salt-marsh species.

At the mouth of the Raritan River the marshes near Perth and South Amboy were kept under close observation throughout June, and toward the end of that month conditions favored the development of an immense brood of mixed *sollicitans*, *cantator* and *tæniorhynchus*. Meanwhile the course of the Raritan had been followed up to Bound Brook and the territory around New Brunswick and Metuchen had been explored for miles without finding similar larvæ. July 1, the Amboy meadows were alive with adults, and during the night of July 2 to 3 the advance guard reached New Brunswick. The main body came during the two or three next following nights and extended up the Raritan valley. Another body followed a depression toward Metuchen and concentrated on Dunellen, where no chance for breeding such mosquito hordes exists.

Culex sollicitans is always the summer pest in the Jersey Pines—even where there is no water of any kind, and yet I had never been able to find in the swamps any larvæ. Mr. J. Turner Brakeley, who had made observations for me in previous years, began, early in this year, a systematic search in all the breeding areas near his cranberry bogs at Lahaway, over twenty miles in a direct line from the shore and nearly forty miles from the Mullica River marshes. He worked out the early life history of *Culex canadensis*, the winter history of *Culex melanurus* and discovered an entirely new species, *Culex aurifer*; but he failed absolutely to find any larvæ of *Culex sollicitans*. Nor did he see even the adults of that species until late in July; up to which time the pines were practically mosquito-free.

Dr. Julius Nelson, biologist to the New Jersey experiment stations, was engaged in oyster investigations on the marshes near Tuckerton during July and, incidentally, kept an eye on mosquito conditions for my benefit. Up to about July 12 the marshes were quite free from both adults and larvæ; but on that date an unusually high tide covered them and, on the 13th, minute wrigglers of *C. sollicitans* were in every water-filled hole. July 21 the males emerged in clouds and only pupæ were in the water. Females were out on the 22d but would not bite. On the evening of the 23d it was warm, with only a light breeze, and just at dusk a peculiar humming noise seemed to fill the air. The source of this was located at a height of between sixteen and twenty feet above the marsh, where clouds of mosquitoes hovered in their marriage flight. On the 24th few males were seen; but the females were now in droves and bloodthirsty as butchers. Then came cold north and west winds that kept the insects low down among the grass. On the 28th the wind veered to the south and continued so all that night and all day on the 29th. On the morning of the 29th the number of mosquitoes on the marsh had diminished materially, and this was yet more decidedly marked on the morning of the 30th when they were quite bearable. But in the woods, where on the 20th there had been few

mosquitoes, they were worse on the 31st, when Dr. Nelson came out to Tuckerton, than they were on the marsh itself.

Dr. Nelson gave me this record on his return to New Brunswick and next morning came a letter from Mr. Brakeley who in previous communications had uniformly reported 'no salts.' Now, however, he sent in great detail, accompanied by specimens as vouchers, a report of how, during the night of July 28-29, *Culex sollicitans* had arrived in swarms and how, during the two nights following, the entire pine region, for several miles round about had become infested. Of the testimony gathered by Mr. Brakeley one item is especially important—a farmer driving out for a doctor early in the evening through a mosquito-free wood and coming back late to find it swarming with bloodthirsty specimens.

Lahaway is exactly in the line of a flight on a south wind from the Mullica River, the distance to be covered is between thirty and forty miles, and the two series of entirely independent observations are altogether too closely congruent to be set aside as accidental and unconnected. The known antecedent conditions and the completeness of the observations leave only one possible explanation. The mosquitoes that left the marshes on the evening of July 28 reached the pines, over thirty miles north, before daylight next morning. What I have given here are examples of the kind of evidence that I have accumulated. It is not a series of isolated observations, but a daily record; made not by one man, but by a number working independently. Nor was the record confined to one period; it extended throughout the summer, beginning with the first larvæ found on the marshes in March and ending only with the last stragglers late in October.

It is of some importance to note that local conditions determine the development of these salt-marsh mosquitoes. All the species (save possibly *nigritulus*) lay their eggs in the mud of the marsh—never in water. Whenever these eggs become covered with water they hatch, and if there is water enough a brood develops. It may rain at Cape May and not at Atlantic City, and there has been a fall of

two inches or more at Newark, when not a drop fell on the Amboy marshes. There is no such thing, therefore, as a uniform breeding throughout the state, though identical conditions, like a general storm, may bring out broods from a number of localities at one time.

Nor is it impossible that, exceptionally, larvæ of any of the salt-marsh forms may be found away from their normal breeding areas. Personally I have never found *sollicitans* in that way; nor have any of my collectors so found it. But larvæ of *cantator* have been found on one occasion half a mile back, though not much above the general marsh level. But these are accidentals, due probably to the desire of a single gravid and perhaps injured female to place her supply of eggs.

JOHN B. SMITH.

RUTGERS COLLEGE, NEW BRUNSWICK, N. J.,
November 25, 1903.

THE CONGRESS OF ARTS AND SCIENCE OF THE ST. LOUIS EXPOSITION.

As has already been stated here, the scientific committee of the St. Louis Exposition, consisting of Dr. Simon Newcomb, of Washington, Professor Hugo Münsterberg, of Harvard, and Professor Albion W. Small, of Chicago, visited Europe during the summer months to present personal invitations to European men of science to take part in the congress. The field was divided so that Dr. Newcomb gave his time to France and England, Professor Münsterberg to Germany and Switzerland and Professor Small to Austria and Russia, and in conjunction with Dr. Newcomb, to England. The committee returned to this country the latter part of September and reported to the Director of Congresses and the Administrative Board in New York, October 13. One hundred and fifteen acceptances have been received, as follows:

DEPARTMENT 1. PHILOSOPHY.

Metaphysics: Bergson, M. Henri, Membre de l'Institut, Paris.

Philosophy of Religion: Pfleiderer, Prof. Otto, The University, Berlin.

Logic: Riehl, Prof. Alois, The University, Halle. Windelband, Prof. Wilhelm, The University, Heidelberg.

Methodology: Ostwald, Prof. Wilhelm, The University, Leipzig. Erdmann, Prof. Benno, The University, Bonn.

Ethics: Sorley, Prof. W. R., The University, Cambridge, Eng.

Philosophy of Law: Binding, Prof. Karl, The University, Leipzig.

Esthetics: Lipps, Prof. Theodor, The University, Munich. Dessoir, Prof. Max, The University, Berlin.

DEPARTMENT 2. MATHEMATICS.

Geometry: Darboux, M. G., Membre de l'Institut, Paris.

Applied Mathematics: Boltzmann, Prof. Ludwig, Leipzig. Poincaré, M. H., Membre de l'Institut, Professor à la Sorbonne, Paris.

DEPARTMENT 3. POLITICS.

History of Asia: Cordier, M. Henri, Paris. Vámbéry, Prof. Armin, The University, Budapest.

History of Greece and Rome: Pais, Signor Ettore, Musée Archeologique, Naples. Mahaffy, Prof. J. P., The University, Dublin.

Medieval History of Europe: Lamprecht, Prof. Karl, The University, Leipzig.

Modern History of Europe: Rambaud, M. A. N., Membre de l'Institut, Paris. Bury, J. B., Cambridge.

DEPARTMENT 4. LAW.

History of Roman Law: Zitelmann, Prof. Ernst, The University, Bonn.

DEPARTMENT 5. ECONOMICS.

History of Economic Institutions: Schmoller, Prof. Gustav, The University, Berlin.

DEPARTMENT 6. LANGUAGES.

Comparative Language: Brugmann, Prof. Friedrich Karl, The University, Leipzig. Paul, Prof. Hermann, The University, Munich.

Semitic Languages: Delitzsch, Professor Friedrich, The University, Berlin.

Indo-Iranian Language: Lévi, Prof. Sylvain, Collège de France, Paris. Macdonnell, Prof. Arthur A., The University, Oxford.

Latin: Sonnenschein, Prof. E. A., The University, Birmingham.

English: Napier, Prof. Arthur Sampson, The University, Oxford.

Germanic: Sievers, Prof. Eduard, The University, Leipzig. Kluge, Prof. Friedrich, The University, Freiburg.